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Towards Reliable Neural Generative Modeling of Detectors

Tuesday, 30 November 2021 17:20 (20 minutes)

The increasing luminosities of future data taking at Large Hadron Collider and next generation collider experiments require an unprecedented amount of simulated events to be produced. Such large scale productions demand a significant amount of valuable computing resources. This brings a demand to use new approaches to event generation and simulation of detector responses. In this talk, we discuss the application of generative adversarial networks (GANs) to the simulation of the LHCb experiment events. We emphasize main pitfalls in the application of GANs and study the systematic effects in detail. The presented results are based on the Geant4 simulation of the LHCb Cherenkov detector.

Significance

The estimation of systematic uncertainty of the neural based simulation is of primary importance for the development of the field. The presentation contains novel studies of fast simulation of the LHCb RICH detector and its comparison to detailed simulation, which allows for better understanding of the systematic effects caused specifically by GANs. We empirically show that the systematic uncertainty related to GANs can be kept under control even in case of significant kinematic differences of described channels. To the best of our knowledge, this is the first study of such kind based on a realistic dataset.

References

Our previous publications on fast simulation, they do not contain the results we propose to present on ACAT 2021:
https://iopscience.iop.org/article/10.1088/1742-6596/1525/1/012097/meta
https://doi.org/10.1016/j.nima.2019.01.031

Speaker time zone

Compatible with Europe

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